Exercise 18

Calculate y'.

$$y = \cot(\csc x)$$

Solution

Recall that the derivatives of the cotangent and cosecant functions are

$$\frac{d}{dx}(\cot x) = -\csc^2 x \quad \text{and} \quad \frac{d}{dx}(\csc x) = -\csc x \cot x.$$

Calculate y' by using the chain rule.

$$\begin{aligned} y' &= \frac{d}{dx}\cot(\csc x) \\ &= -\csc^2(\csc x) \cdot \frac{d}{dx}(\csc x) \\ &= -\csc^2(\csc x) \cdot (-\csc x \cot x) \\ &= \csc x \cot x \csc^2(\csc x) \end{aligned}$$